casts of Sivalik Fossils lately presented by the Hon. E. I. Company to the Academy, which had been mutilated in the transportation, would be replaced by others, which were already in course of preparation.

A communication was read from the Secretary of the American Philosophical Society, dated October 21, 1848, acknowledging the receipt of No. 2, New Series, of the Journal of the Academy.

November 28th, 1848.

MR. VAUX in the Chair.

The Committee appointed to superintend the printing of the New List of Members and Correspondents, reported that they had performed that duty, and that copies were ready for distribution. The List comprises the names of 70 life members, 80 contributing do., 33 non-contributing do., and 62 deceased do., total 245; and of Correspondents, foreign 257, (42 deceased) and domestic 263, (45 deceased) total 520. Total Members and Correspondents to Oct. 1, 1848—765.

The Committee to whom was referred Professor Johnson's letter in reference to a memorial to Congress recommending the addition of one or more Naturalists to the Astronomical expedition now being fitted out for Chili, by order of the Government, *Reported*, that they consider this addition as of great importance, and would recommend the appointment of a Committee, with authority to take such steps in the matter as may be necessary to ensure this result. Report adopted, and on motion, the whole subject was referred to the same Committee, viz: Dr. Morton, Dr. Bridges, and Mr. Vaux.

December 5th, 1848.

MR. PHILLIPS in the Chair.

A letter was read from the Secretary of the Smithsonian Institute, transmitting the first volume of their "Contributions to Knowledge," with a Circular describing the plan of organization of the Institution, and a printed list of queries addressed to the Librarian of the Academy in relation to the Library.

A letter was also read from the Imperial Society of Naturalists of Moscow, dated August 17, 1848, accompanying several numbers of the Bulletin of that Society.

Dr. Leidy offered the following observations on the development of bone, the structure of articular cartilage, and on the relation of the areolar tissue with muscle and tendon.

1. *On the development of the Purkinjean corpuscle in bone.*—Schwann, in his "Mikroskopische Untersuchungen," considers that the Purkinjean corpuscle of bone is derived from the pre-existing cartilage cell, and that the canaliculi are prolongations, or protrusions of the cell wall. Many later authors, among whom are Gerber, and Todd and Bowman, express the opinion that it originates in the nucleus of the temporary cartilage cell, and Tomes entertains the idea, that after the formation of the osseous tubes, in the process of ossification, the latter are

filled up by a deposite of osseous granules, and while this deposite is going on, small cells are left, which are the rudimentary Purkinjean corpuscles. Henle thinks them to be the cavities of cells, the thickened walls of which are pierced by the canaliculi. Hassall confirms the view of Schwann, by stating "the bone cells (Purkinjean corpuscles,) are to be regarded as complete corpuscles, the canaliculi of which are formed by the extension of the cell wall, which is proved by watching the formation and development of bone."

The opinion of Schwann and Hassall I can fully corroborate from my own observations upon an ossifying frontal bone, from a human embryo measuring two inches from heel to vertex. Each lateral half of the bone is about $3\frac{1}{2}$ lines in diameter, and presents to the naked eye the appearance of a delicate and close net-work, arising from the numerous areolæ occupied by temporary cartilage. The frontal and orbital plates, it is worthy of incidental remark, at this period, are nearly on a plane with each other, or are connected together at a very obtuse angle along a central, transverse, crescentic, raised line, the rudimentary supra-orbitar ridge.

The mode of development of the Purkinjean corpuscle, as noticed upon the upper or posterior border of the os frontis, is briefly as follows: After the primitive ossific rete has been formed from the deposite of the osseous salts, enclosing groups of cartilage cells in the areolæ, the further deposite takes place in a fibrous or line-like course from the parietes of the areolæ of the primitive osseous rete, in the interspaces of the cartilage cells nearest to, or in contact with the sides of the areolæ. At this period the cells shoot out or extend their canaliculi between the fibrillæ just formed, and then the cell-wall and continuous walls of the canaliculi fuse with the translucent, homogeneous, or hyaline substance of the cartilage existing between the cells and the osseous fibrillæ, and with the fibrillæ themselves, by the deposite of the osseous salts. The period of the formation of the canaliculi appears to be quite definite, occurring during the deposite of the osseous salts, and not before. To such an extent is this the case, that I noticed in several instances cells which had formed their canaliculi upon the side which was ossified, while upon the other side I could not distinguish any trace of them.

During the whole time of the formation of the Purkinjean corpuscle, the nucleus remains unchanged; at least no change is perceptible in it beneath the microscope, and by applying tincture of iodine to the preparation, which turns the nucleus brown, I was able to detect it within the perfected Purkinjean corpuscle, not only corresponding to the nucleus of the remaining unossified cartilage cells in granular structure, but also in its measurements. After the Purkinjean corpuscle has been formed a short time, the nucleus dissolves away or disappears.

The newly formed Purkinjean corpuscle is about the same size as the remaining unossified cartilage cells, as indicated in the list of measurements appended to these notes.

Size of cell of temporary cartilage, from the unossified os frontis of a human embryo, $\frac{1}{1886}$ of an inch; nucleus of do. $\frac{1}{3125}$ of an inch; nucleolus $\frac{1}{8333}$ of an inch; Purkinjean corpuscle $\frac{1}{1865}$ of an inch; nucleus within the same $\frac{1}{3030}$ of an inch.

2. *On the intimate structure of articular cartilage.*—As is familiar to every anatomist, articular cartilages always fracture in a direction perpendicular to

their surface, the broken edge presenting a striated appearance in the same direction. This character the older anatomists ascribed to a fibrous or columnar structure of the cartilage, like that of the enamel of the teeth, while histologists at the present day, consider it as dependent upon the vertical arrangement of the rows of cartilage cells, although it has been suspected to depend upon some ultimate arrangement of the matrix or intercellular substance not yet detected. In some late observations upon the structure and development of articular cartilage, through means of an excellent microscope, made for me by Messrs. Powell & Lealand, of London, I have been enabled to discover a definite structure in the intercellular substance. This consists of an arrangement of exceedingly fine, transparent filaments, nearly uniform in thickness, and having an average measurement of the $\frac{1}{25000}$ of an inch. An easy method of detecting this filamentous structure, is to tear a fine fibre from the broken edge of an articular cartilage which has been macerated in diluted muriatic acid, by means of a fine pointed forceps, and exposing it in the ordinary way in water beneath the microscope, using the quarter or eighth inch objective power. The fine filaments, partly detached, will be seen in great numbers along the sides of the fibre. When these filaments are viewed by very oblique light, they appear to have an indistinct granular appearance, each composed of a single row of granules, which of course, in the articular cartilage, adhere together with greater tenacity in the direction of the length of the filaments than laterally.

When an articular cartilage is broken in a direction from the under to the free surface, it is found that the fragments adhere by a membranous layer, covering the free surface of the cartilage, which, by the older anatomists, was considered as the extension of the synovial membrane; by the anatomists of our day, either as a homogenous layer, or as nothing more than a stratum of the cartilage the rows of cells of which take a direction parallel with the surface, or at right angles to those more deeply situated, and thus giving rise to this distinct laminated condition. That it is a cartilaginous layer is undoubtedly correct, but instead of the rows of cells determining the arrangement, I find it depends upon the filamentary structure of the matrix, the filaments taking a course parallel with the surface of the cartilage, in a direction at right angles to those forming the matrix of the deeper part of the cartilage.

A straight fibre may be torn from the articular cartilage, and in the act of tearing, should a row of cells be in the line of rupture, as is frequently the case, (for although generally following the course of the filaments, yet a number are oblique or even somewhat irregular,) it will be torn through, which in itself would be sufficient to indicate that the fibrous arrangement of the cartilage did not depend upon its rows of cells, and indeed they have but little or no influence in this respect.

From the foregoing description of the structure of the intercellular substance of articular cartilage, it can be readily understood that it may determine the course of the rows of cells, which is really the case. In the earliest period of the existence of the articular cartilage, the cartilage cells are single, isolated, and equally diffused throughout a mass of hyaline substance, which latter in the progress of development becomes indistinctly granular, and then for the first time have I observed the appearance of the filamentary structure. In the splitting up of the primary cartilage cell and development of others, they arrange themselves in the direction in which there is least resistance, which would be of course in the direction of the filaments of the intercellular matrix. Hence, in the deeper part of the articular cartilage, the rows of cells are generally vertical to the surface, and parallel to the same in its more superficial portion.

In some of the articular cartilages sometimes there are peculiarities of structure which I think have never been pointed out, and are worthy of notice.

In the articular cartilage of the condyles of the os femoris, I have occasionally noticed numerous minute lacunæ? found in greatest abundance near the surface of attachment, and gradually decreasing in number until they entirely disappear in the superficial third of the cartilage. They are elongated, compressed, and their long diameter is invariably situated transversely, at right angles to the filamentous matrix, or parallel with the surface of the cartilage. The longest measure transverely $\frac{1}{1200}$ of an inch, the shortest $\frac{1}{3125}$ of an inch, in the vertical direction $\frac{1}{6250}$ of an inch. When well defined, they appear more transparent than the cartilaginous matrix in which they are situated, when viewed a little within the focus they appear deep black.

Fibres of bone are not unfrequently met with in the articular cartilages, especially in that of the head of the os femoris. They are generally found near the surface of attachment, but are not the continuation of the bony structure upon which the cartilage is placed, for they are always arranged in a direction parallel to the surface. They are compressed cylindrical in form, and in transverse section present an elliptical figure, the long diameter of which is placed at right angles to the filaments of the cartilage matrix. They present a concentrically laminated and a radiated structure, resembling somewhat that of the Haversian ossicle, but they neither present the canal nor the Purkinjean corpuscles.

The foregoing observations on articular cartilage will be more detailed and illustrated by figures hereafter, in one of our medical journals.

3. *On the arrangement of the areolar sheath of muscular fasciculi and its relation to the tendon.*—Well known is it that the fasciculi of fibres of the muscles are surrounded by sheaths of areolar tissue, but the arrangement of the filaments of fibrous tissue forming the sheaths, and their relation with the tendon, I think has not been properly pointed out. From repeated observation, I have found that the filaments of fibrous tissue cross each other diagonally around the muscular fasciculi, forming a doubly spiral extensible sheath. None of the filaments run in the direction of the length of the fasciculi, and but few are transverse. Many of the filaments of a sheath form an interlacement in the same diagonal manner with the filaments of the sheaths of neighbouring fasciculi. This arrangement is readily distinguished, if several fasciculi be drawn slightly from each other upon a plate of glass, and the intervening areolar tissue be viewed beneath the microscope. When the filaments reach the rounded extremities of the fasciculi, they become straight, and in this manner conjoin with the tendinous filaments originating at the extremities of the muscular fibres. The importance of this arrangement can be readily understood; from the diagonally crossing course of the areolar filaments, comparatively inelastic in themselves, the sheath is rendered elastic, thus permitting the muscular fibres freely to move without their action being interfered with, while at the point of attachment of the fasciculi, where any elasticity would be worse than useless, from the fact that part of the

muscular action would be lost in the mere extension of an elastic substance, we find the filaments arrange themselves so as to become part of the inextensible tendon.

December 12th, 1848.

Dr. Bridges in the Chair.

A letter was read from the Secretary of the American Academy of Arts and Sciences, dated Cambridge, Mass., December 7, 1848, transmitting Vol. 3, New Series, of its Memoirs.

Also a letter from Major Proby T. Cautley, dated Roorkhi, India, June 23, 1848, in relation to two boxes of fossils shipped by him in 1844 for the Academy.

Mr. Conrad presented a paper entitled, "Descriptions of two new genera and three new species of recent Shells," &c., which was referred to Drs. Griffith, Wilson, and Leidy.

December 19th, 1848.

Mr. Phillips in the Chair.

A letter was read from Lieut. J. M. Gilliss, U. S. N., dated Washington, December 11, 1848, acknowledging the receipt of his notice of election as a Correspondent.

Mr. Conrad read the descriptions of four new species of recent Shells, as an addition to his paper presented at last meeting. Referred to the same Committee.

Dr. Gambel presented a Catalogue of the family Columbidæ contained in the collection of the Academy, with remarks on the same; which was referred to a Committee, consisting of Mr. Cassin, Dr. Wilson, and Dr. Townsend.

Mr. Cassin read a paper entitled "Descriptions of new species of Owl," in the collection of the Academy of Natural Sciences of Philadelphia. Referred to Drs. Wilson, Gambel, and Townsend.

Dr. Gambel read a paper entitled "Contributions to American Ornithology," which was referred to Mr. Cassin, Dr. Townsend, and Dr. Heerman.

Dr. Hallowell read the description of a new Salamander, from California. Referred to Dr. Leidy, Dr. Gambel, and Dr. Bridges.

On motion it was unanimously *Resolved*, That the Publication Committee be authorized to present to Dr. William Blanding, a copy of Parts 1 and 2, New Series, of the Journal of the Academy.

December 26th, 1848.

Dr. Bridges in the Chair.

The Committee to whom was referred Mr. Conrad's descriptions of new Shells, read 12th and 19th insts., reported in favour of publication entire in Part 3, New Series of the Journal, and the following abstract in the Proceedings.